Aerospace Vehicle Systems Institute

Defense Standardization Program Conference

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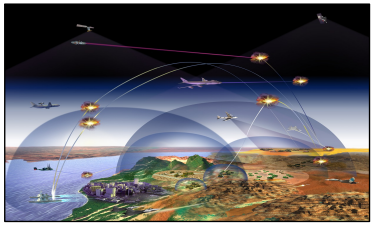
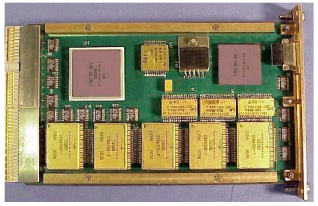
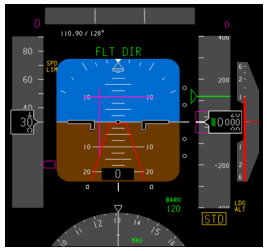
Aerospace Vehicle Systems Institute - AVSI

Cooperative Overview

Texas Engineering Experiment Station
Texas A&M University

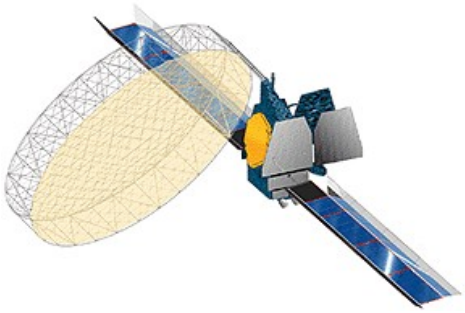






Presentation Outline

- **AVSI overview & background**
- **AVSI Process for Research projects**
- **AVSI Projects**

AVSI Mission

Dramatically reduce aerospace vehicle systems life-cycle cost and accelerate development of systems, architectures, tools, and processes through cooperation between industry, government and academia.

AVSI Cooperative Agreement

- **AVSI governed by over-arching Cooperative Agreement**
  - **Signed by the original AVSI members on August 19, 1998**
  - **Counter agreement signed by new members when they join**
- **The Cooperative Agreement defines how things are handled**
  - **External communications and publications**
  - **Ownership and protection of Intellectual property**
  - **Accounting procedures**
  - **Project AFE and Annual Research Plan**
  - **Etc.**
- **Modifications to the Cooperative Agreement**
  - **Approved by the Executive Board on May 22, 2002**
  - ***New Membership structure: Full, Associate, Liaison* Members**

Objectives of AVSI

- Create a financial and technical “critical mass” of industry members
  - **Pool/leverage resources**
  - **Efficiently engage experts from industry & academia**
- Foster creation of standard systems, architectures, tools, and processes for aerospace industry
- Synergistic and industry-centered solutions

Responsibilities

- **Project Management Committees (PMC)**
  - **Identify the PMC Chairman**
  - **Responsible for developing and monitoring the progress of their work-statement, deliverables, schedules, contractor, etc.**
  - **Responsible for generating a project "Commercialization Plan"**
    - **Release of project results**
  - **Approval of new members joining the project after deadline**
  - **PMC Chairman - Provide Monthly and Quarterly status report**
    - **Conduct regular meetings and telecons as necessary**
  - **Disseminate information within their respective company**

Funding

- **Members pay an annual subscription fee to cover AVSI staffing/overhead (~ $15,000/yr)**
- **Project costs are split equally by only those members who decide to participate**
  - **5% fee assessed on projects for AVSI Overhead (managed by the AVSI Executive Board)**
  - **Each project contract is assessed a one time fee (~$11.375K) for Texas A&M support; contracts organization, business management, technology & licensing & communications division**
- **Project Technology can be licensed and any revenues will be split between Participants and AVSI**

Guidelines for appropriate AVSI projects

- **Develop new / improved aerospace systems, tools & processes with large benefits for those involved**
  - **improved cycle-time**
  - **better quality**
  - **lower costs**
  - **higher reliability**
- **Foster creation of standard / open systems architectures**
- **Make a high level difference without impacting each members' differentiating competitive advantage – stay away from "competition sensitive"studies**
- **Have a commitment by the end-user in their respective company**
- **Have a strong "sponsor" & "champion" in their respective company**

Guidelines for appropriate AVSI projects

- **Appropriate for AVSI (Avoid duplication of effort by other entities doing the same thing)**
- **Leverage resources with a strong business case**
- **Proposals are welcomed from all members**
- **Consensus is desirable - but not essential**
- **Consider;**
  - **Not all companies will want to participate in all projects**
  - **Any combination of OEMs, Suppliers, and Government Agencies teaming is okay**
  - **Utilize universities resources or other research institutes - where appropriate**
  - **Smaller and technically "risky" projects are okay**
  - **It is Ok to have a multiple phase (multi-year) or gated project**

Tools & Processes Dev. Panel - Launched Projects

EAFE #1 Develop the "How to" of a Qualification Compiler & Linker

AFE #1, 1S1 Systems Engineering & Information Management

AFE #4 Rapid Prototyping Tools for Flight Deck Display Systems

AFE #7, 7S1 Cert Issues for Embedded Object Oriented S/W

AFE #10 Tools and Best Practices for Implementing RTCA Do254

AFE #23 Cert Guidelines for the Integration of Wireless Communications for Aircraft

AFE #31 Redesign Existing Hardware Due to Obsolete Parts

AFE #32 Improved Software Verification Methods and Support Tools

System Development Panel - Launched Projects

AFE #3, 3S1, 3S2 Defining Real Operating Environments; Temps & Power Quality

AFE #6 Systems Bus Study

AFE #14 Wireless Com. for Aircraft Systems

AFE #16, 16S1 Mitigating Radiation Effects on Current & Future Avionics Systems

AFE #17, 17S1 Methods to Account for Accelerated Semiconductor Device Wear out

AFE #18, 18S1 Thermal Mgmt of COTS based Avionics

AFE #21, 21S1 Fuel Cell Auxiliary Power Unit for Transport Aircraft

AFE #24, Micro Electro-Optical Sensors for Commercial & Military Aircraft Applications

AFE #27 Structural Load & Environmental Monitoring

AFE #28 Modular Open Systems Approach Interoperability

AVSI Project status

AFE #16 Mitigating Radiation Effects on Current & Future Avionics Systems

Project description; To develop a set of guidelines to mitigate atmospheric radiation effects on current and future aircraft avionics systems and electronics devices.

Period of Performance; 1/7/02 to 12/20/02

Participants; Boeing, Honeywell, Smiths Aerospace & TRW

Project cost; $156,800.00 Status; Endorsed on 8/8/01. Project launched 1/7/02. Initial phase of the project is complete.

AFE #16S1 Mitigating Radiation Effects on Current & Future Avionics Systems

Project description; To develop a set of guidelines to mitigate atmospheric radiation effects on current and future aircraft avionics systems and electronics devices.

Period of Performance; 3/17/03 to 3/12/04

Participants; Boeing, DoD, FAA, Honeywell, Smiths Aerospace & Goodrich Aerospace

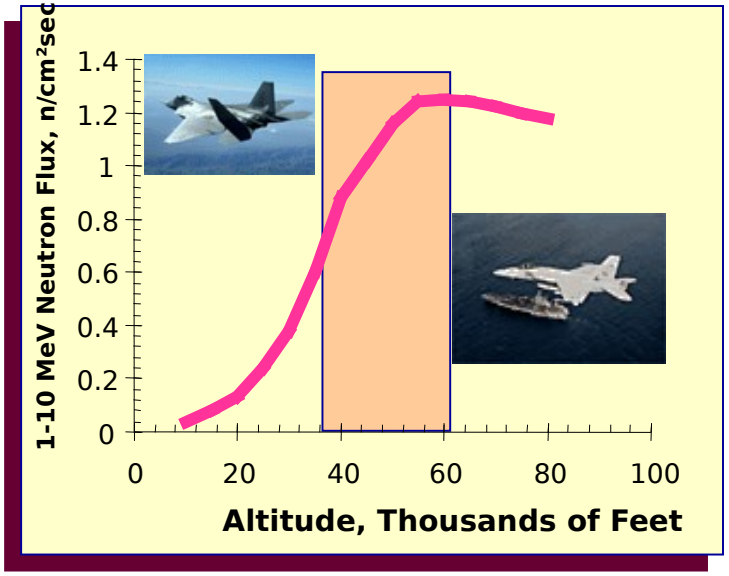
Project cost; $138,500.00 $173,125.00

Status; PMC approved supplement on 3/21/03. Project is ongoing.

Project 16: Radiation Effects

Technology Node, nm	Sensitive Volume (Si), μ^3	Sensitive Depth (SOI), μ	Critical Charge (Si), fC
250	0.245	0.15	8
130	0.025	0.15	2.5
90	0.01	0.07	1.2
65	0.0035	0.05	0.8

P. Roche, G. Gasiot, K. Forbes, V. O'Sullivan, V. Ferlet, "Comparisons of Soft Error Rate for SRAMs in Commercial SOI and Bulk Below the 130 nm Technology Node," 2003 IEEE Nuclear and Space Radiation Effects Conference.



Current estimates for SEU rates are based on "old" technology

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Project 16: Radiation Effects

Almost all testing is done on memories, and the processes for testing logic devices are not well-defined

Effects of thermal neutrons are unknown

Test results are not "portable" from one manufacturer to another, or even from lot to lot

Most atmospheric radiation tests are conducted for sea-level applications

AVSI Project status

AFE #17 Methods to Account for Accelerated Semiconductor Device Wear out

Project description; To develop methods to evaluate mechanisms and accommodate the effects of accelerated semiconductor device wear out on avionics system design, production and support..

Period of Performance; 1/7/02 to 12/20/02

Participants; Boeing, Goodrich Aerospace, Honeywell, Smiths Aerospace and TRW

Project cost; $207,935.00

Status; Endorsed on 8/8/01. Initial phase of the project is complete.

AFE #17S1 Methods to Account for Accelerated Semiconductor Device Wear out

Project description; Continue to develop methods to evaluate mechanisms and accommodate the effects of accelerated semiconductor device wear out on avionics system design, production and support.

Period of Performance; 1/1/03 to 12/31/03

Participants; Boeing, DoD, FAA, Goodrich Aerospace, Honeywell and Smiths Aerospace

Project cost; $168,500.00 $202,200.00

Status; PMC approved supplement on 12/17/02. Project is launched.

Project 17: Methods to Account for Accelerated Semiconductor Device Wearout

Description:

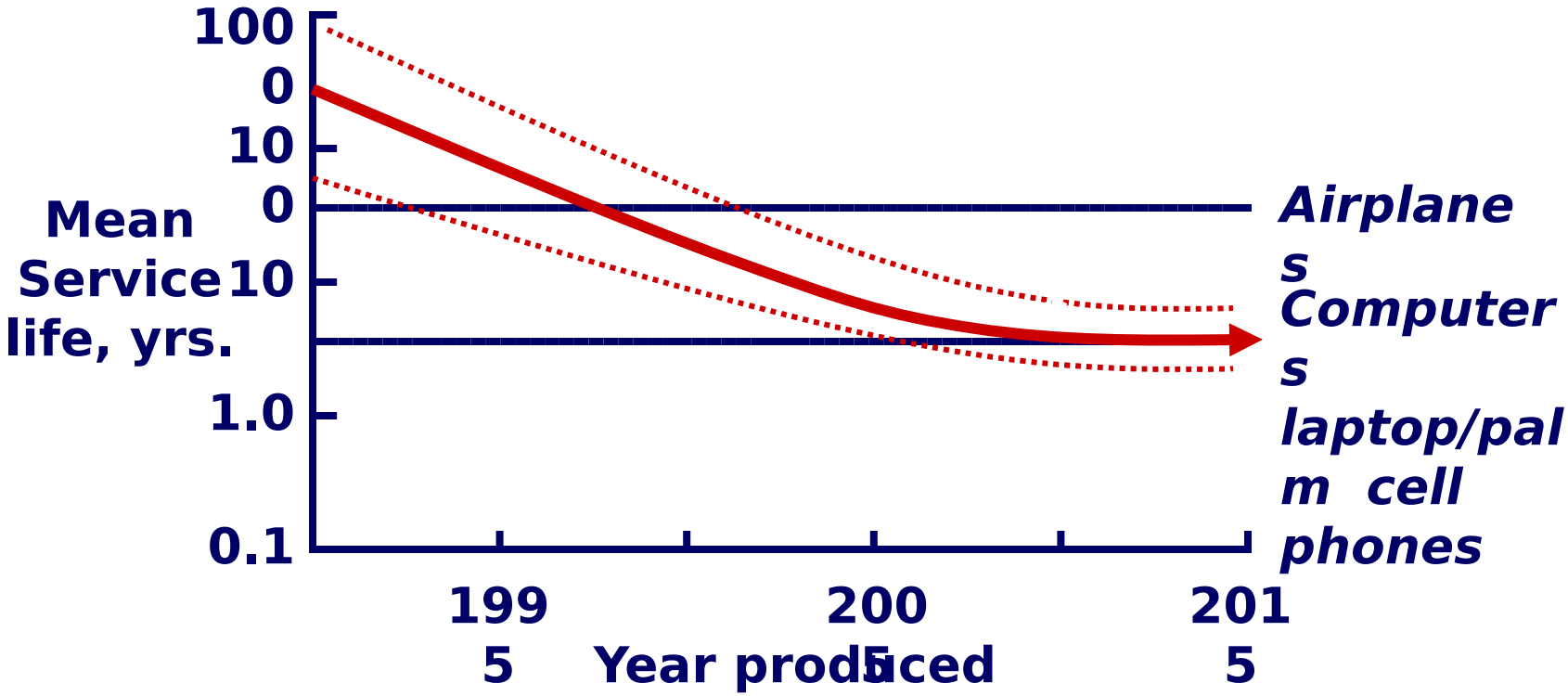
Determine effects of current and future device technology on service lifetime, and their impact on avionics systems. Develop methods to respond to negative impacts.

Deliverables:

- **Mathematical models of the major wearout mechanisms**
- **Methods to make tradeoffs among service life, temperature, frequency, voltage, etc.**
- **System design guidelines for using future semiconductor devices**

Project 17

For "target markets," performance is traded against reliability (often defined as lifetime)

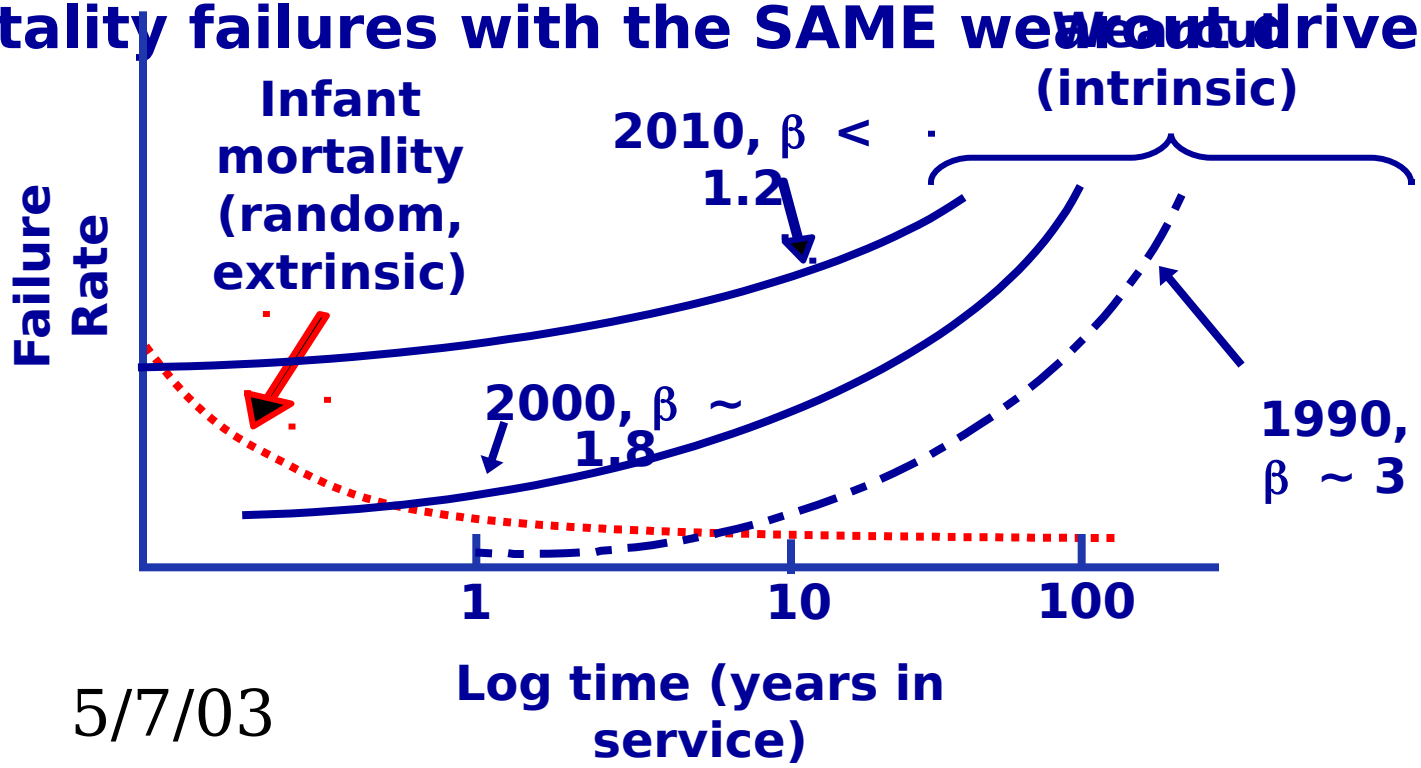


Known trends for TDDB, EM and HCI degradation

(ref: extrapolated from ITRS roadmap)

Project 17: Device Reliability Trends

As technology progresses, Weibull slopes approach 1 and wearout failures become statistically indistinguishable from infant mortality failures with the SAME wearout drivers.



Project 17: Possible Solutions

1. If you CAN NOT change the specs:
   - Calculate a more accurate FIT rate so you can design for maintenance, replacements and upgrades accordingly.
2. If you CAN change the specs:
   - DERATE the parts to extend the lifetime and reduce maintenance cost.
   - Design new systems according to accurate failure/replacement rate.


"Working Together"
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